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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/893,791	06/29/2001	Yutaka Kobayashi	PNDF-01068	4575

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EXAMINER

CHU, CHRIS C

ART UNIT	PAPER NUMBER
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2815

DATE MAILED: 04/08/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/893,791

Applicant(s)

KOBAYASHI, YUTAKA

Examiner

Chris C. Chu

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 March 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 - 13 is/are pending in the application.
- 4a) Of the above claim(s) 5 - 13 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1 - 4 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 5 . 6) ☐ Other: _____

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of Group I in Paper No. 3 is acknowledged.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1 ~ 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over the acknowledged prior art of Fig. 1 in view of Enomoto et al.

The acknowledged prior art discloses in Fig. 1 a semiconductor device, comprising:

- a semiconductor chip (100),
- a chip-mounting substrate (103) which is provided with the semiconductor chip mounted on a top surface thereof and first conductive pads (107) formed on a bottom surface thereof and connected with the semiconductor chip electrically,
- solder balls (106) formed on the first conductive pads,

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- a printed circuit board (104) on which second conductive pads (108) connected with the solder balls are formed, and
- underfill material (105) injected into a clearance formed between the chip-mounting substrate and the printed circuit board,

The acknowledged prior art does not disclose unevenness being formed on a surface of the printed circuit board. Enomoto et al. discloses in Fig. 1d unevenness being formed on a surface of a printed circuit board. It would have been obvious to one of ordinary skill in the art at the time of the present invention was made to use the uneven surface of the printed circuit board of Enomoto et al. in the device of the acknowledged prior art of Fig. 1 in order to provide an adhesive for the printed circuit board having excellent thermal resistance, electrical resistance, chemical stability and adhesion property to the printed circuit board as taught by Enomoto et al. in column 2, lines 43 ~ 48.

Regarding claim 2, Enomoto et al. discloses in Fig. 1d the unevenness being formed on the first conductive pads or on the second conductive pads selectively.

Regarding claim 3, Enomoto et al. discloses in Fig. 1d the unevenness being shaped into a slit-like configuration or into a dimple-like configuration.

4. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kweon et al. in view of Sakuma et al.

Kweon et al. discloses in Fig. 2A a semiconductor device, comprising:

- a semiconductor chip (21),

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- a lead frame (23, 25 and 27) which is provided with the semiconductor chip mounted thereon and electrically connected with the semiconductor chip, and
- a printed circuit board (28) including third conductive pads (29), which are formed thereon and brought into contact with the lead frame.

Kweon et al. does not disclose at least one of the lead frame and the printed circuit board being provided with unevennesses at contact surfaces therebetween. Sakuma et al. discloses in Fig. 7 at least one of a lead frame (3) and a printed circuit board being provided with unevennesses at contact surfaces therebetween. It would have been obvious to one of ordinary skill in the art at the time of the present invention was made to use the unevennesses at contact surfaces between at least one of the lead frame and the printed circuit board of Sakuma et al. in the device of Kweon et al. in order to improve connection between the lead frame and the printed circuit board as taught by Sakuma et al. in column 3, lines 42 ~ 46.

Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Tsao, Oura et al., Kaskoun et al., Berg et al. and Usami et al. disclose a semiconductor device.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chris C. Chu whose telephone number is (703) 305-6194. The examiner can normally be reached on M-F (10:30 - 7:00).

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on (703) 308-1690. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7382 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Chris C. Chu
Examiner
Art Unit 2815

c.c.
April 3, 2002



EDDIE LEE
SUPERVISORY PATENT EXAMINER
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